

Microdiffraction studies of the crystallinity of bone tissues

Anders Rindby

Dept. of Physics, Chalmers University of Technology, S-412 96 Göteborg, Sweden

Per Engström

European Synchrotron Radiation Facility, BP 220, 38043 Grenoble, France

Panagiotis Voglis

Dept. of Forensic Medicine, University of Göteborg, Göteborg, Sweden

A series of studies of the crystallinity of bone tissues have been undertaken by means of synchrotron-based microdiffraction. Beside the crystal structure itself, crystallite size distribution and preferential orientation were also studied with a spatial resolution comparable with the lamellae thickness (about 7 μm). The experiments were performed at the microfocus beamline 1 at ESRF. The samples were longitudinal and transversal cuts from human femoral shafts. The result shows that the bone crystallites have an apatite structure and that they seem to be oriented in two orthogonal directions, one parallel with the haversian system and the other perpendicular following the lamella's curvature. Peak width analysis shows that the crystallites are about 25 - 40 nm along the c-axis with a width of about 10 nm. The result also shows that the peak width is somewhat larger close to the haversian canal compared to the outer region of the osteon.